

Gravina Access Project

Construction Impacts Technical Memorandum

Draft



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Executive Summary

The purpose of this Memorandum is to discuss the potential temporary impacts of constructing additional access to Gravina Island. The Memorandum considers the specific impacts of bridge and bridge-approach construction for Alternatives C3(a), C3(b), C4, D1, and F3; ferry terminal construction for Alternatives G2, G3, and G4; and roadway construction for all alternatives. Long-term impacts, such as the impact of bridge construction and subsequent closure or restriction of operations in the East and West Channels on the tourism economy, effects of piers and other in-water structures, and impacts to aviation, including floatplanes, are not considered.

The evaluation is divided into 11 areas of potential impact: land use, social and economic environment, physical environment, biological resources, historic and archaeological resources, visual environment, transportation, hazardous waste sites, utilities, and energy. All of the alternatives will require the use of staging areas for equipment and materials. Impacts to these areas are expected to be temporary. The land will be returned to its previous use when construction is finished and revegetated with native plants and soils as needed. In addition, land for right-of-way and for roadways, bridges, and terminals will need to be acquired. Any habitat or wetlands on this land will be lost, though the alternative alignments were selected to avoid impacts to wetlands and streams to the extent practicable.

Temporary construction impacts are expected to be none or negligible for all areas considered except for subsistence. Subsistence use will be adversely affected, but harvests are not expected to be reduced. Historic and archaeological sites are known or are likely to occur in areas traversed by Alternatives F3, G2, and G3. A detailed evaluation of historic and archaeological sites in accordance with 36 CFR 800.4 will be conducted after selection of the preferred alternative.

Section	Page
Executive Summary	SUM-1
1.0 Introduction	1
2.0 Land Use.....	1
3.0 Social and Economic Environment	2
3.1 Demographics	2
3.2 Community Facilities	2
3.3 Recreation Resources	2
3.4 Economy	3
4.0 Physical Environment.....	4
4.1 Geology, Topography, and Soils.....	4
4.2 Water Resources	5
4.2.1 Hydrology.....	5
4.2.2 Water Quality	5
4.3 Air Quality	5
4.4 Noise and Vibration	6
5.0 Biological Resources	6
5.1 Vegetation	6
5.1.1 Uplands.....	6
5.1.2 Wetlands	7
5.1.3 Aquatic Habitats	7
5.2 Wildlife	7
5.2.1 Aquatic Species	7
6.0 Historic and Archeological Resources	9
7.0 Visual Environment.....	10
8.0 Transportation	10
8.1.1 Aviation.....	10
8.1.2 Marine Navigation.....	11
8.1.3 Roadways	12
8.1.4 Pedestrians and Bicyclists	12
9.0 Hazardous Waste Sites	12
10.0 Utilities	13
11.0 Energy	13

1.0 Introduction

Construction impacts are any temporary impacts on environmental resources in the project area that are caused by the activities associated with the construction of the project, but not the permanent impacts of its continued existence and operation. This technical memorandum discusses potential construction impacts on land use, socioeconomic factors, the physical environment, biological resources, historic and archeological resources, transportation systems, hazardous waste sites, utilities, and energy.

The major potential construction activities considered in this evaluation are:

Bridge/bridge approach construction for Alternatives C3(a)/(b), C4, D1, and F3:

- Preparing foundation for bridge piers and abutments
- Erection of shoring and falsework
- Drilling through rock and sediment
- Pile driving
- Installing piers and abutments
- Constructing bridge span(s)

Ferry terminal construction for Alternatives G2, G3, and G4:

- Construction of parking lots, passenger facilities, and docks

Roadway construction for all alternatives:

- Acquisition of right-of-way
- Demolition of structures and disposition of debris
- Mining of borrow material (for aggregate fill)
- Preparation of foundation (grading, filling, compacting)
- Temporary rerouting of traffic at existing road links

2.0 Land Use

Temporary impacts to land use associated with construction of the project alternatives would result from use of certain parcels for staging equipment and supplies. The locations of staging areas for each alternative have not been determined; therefore, specific impacts to land use are not known at this time. Vacant land would likely be used for staging areas to minimize disruption of businesses, residences, and the community.

All of the project alternatives would require acquisition of right-of-way or other land (and conversion of its land use to transportation) in order to begin construction; however, these land use impacts would be permanent impacts of the project and, therefore, are not included in this evaluation of construction impacts.

Properties in which a portion of the property is traversed by the project right-of-way could be affected by project construction, but could return to normal (pre-construction) use following construction. These properties include:

- Bank and car dealership at the intersection of Tongass Avenue and Signal Road (Alternative C3[a]/[b])
- Residential properties along Baker Street North and Bucey Avenue North (Alternative C3[a]/[b])
- Ketchikan Redi-mix Quarry (Alternatives C4 and D1)
- Commercial properties at access road to Peninsula Point (Alternative G2)

Use of these properties during construction could be disrupted by construction noise, movement of construction vehicles and equipment, and access control. Use of open space areas on Gravina and Pennock islands could also be affected by construction noise, vehicles, and equipment in areas traversed by the project alternatives. The effects of construction on use of open space areas would occur over a small percentage of the overall available open space on Gravina and Pennock islands.

3.0 Social and Economic Environment

3.1 Demographics

Project construction activities would have no impacts on the size or composition of the general population. No distinct population group (i.e., minority, low-income, elderly, or handicapped) would be affected by construction of any of the alternatives.

3.2 Community Facilities

None of the project alternatives are expected to result in construction impacts on the hospital, schools, fire stations, and police department in the Borough, or on the provision of emergency services in the Borough and at Ketchikan International Airport. Vehicular access to all community facilities and existing operational capacity will be maintained throughout construction.

3.3 Recreation Resources

Pleasure Boating and Fishing

Pleasure boating and fishing in Tongass Narrows would be affected in the immediate areas around the in-water and shorefront construction zones. These recreation opportunities would be most affected by the bridge alternatives (C3[a]/[b], C4, D1, and F3), which would constrict passage in some areas of the channel. The effects of construction of the ferry alternatives (G2, G3, and G4) would be limited to the nearshore/shorefront areas. Given the extent over which pleasure boating and fishing occur in Tongass Narrows, the effects of construction of any of these alternatives on such recreation activities would be negligible.

Fishing, Hunting, Hiking, and Bicycling

None of the project alternatives would cause any substantial construction impacts on fishing, hunting, hiking, and bicycling recreational activities on Revillagigedo, Gravina, and Pennock islands, other than diverting such activities away from the immediate construction zones. The land area directly affected by construction activities would be an extremely small portion of the overall amount of land available for these recreational activities.

City Recreational Activities

There would be no substantial construction impacts on recreational activities in Ketchikan, including the use of parks, trails, playing fields, recreation areas and centers, and tennis courts.

3.4 Economy

Employment and Personal Income

Construction of the project (estimated at a 30-month duration) would require about 200 workers. While some jobs would be created for local residents, many jobs would require skilled specialists to be brought in from outside of the Ketchikan area. Additional services (hotel, restaurant, etc.) to support the construction effort could create some local jobs; however, overall growth in the local area employment and personal income as a result of project construction would be moderate.

Forest Products

Project construction could use local timber for falsework and shoring. The overall effects on the forest products industry would be negligible.

Seafood Industry

Project construction would have no effect on commercial fishing and seafood processing in the area.

Tourism

Construction activities of any of the project alternatives would have a minor impact on tourism in the Ketchikan area. Construction of roadways on Gravina and Pennock islands could affect tourists visiting these areas, but such tourists represent a very small percentage of the region's tourism economy. Because most tourist activities occur in the downtown area within one-half mile of the cruise ship docks, construction of the roadways and bridge approaches for Alternatives C3(a)/(b), C4, D1, and F3, and construction of the ferry terminals for Alternatives G2, G3, and G4 on Revillagigedo Island would not affect tourism in the downtown area.

During construction of 185/200-foot high bridges (i.e., Alternatives C3[a], C4, and F3 west channel), ship passage would be maintained throughout construction or construction activities and timed to occur during the off-season for cruise ships. Construction of a 120-foot high bridge

(Alternatives C3[b] and D1) or 60-foot high bridge (Alternative F3 east channel) would lead to the effective closure of these channels to ships with an air draft higher than the 60' or 120' high bridges would accommodate. The impacts to the tourism economy resulting from construction of these bridges are considered long-term effects of the project and are not included in this evaluation of construction impacts. Floatplane use of portions of Tongass Narrows could be affected by construction activities associated with the bridge crossings (Alternatives C3[a]/[b], C4, D1, and F3); however, a reduction in floatplane operations is not expected.

Sportfishing activities and the activities of small touring ships would remain unaffected by construction of any of the project alternatives, except where maneuvering in the construction zone would be restricted. There would be no economic impact for this sector of the tourism economy.

Government

Construction of the project could generate a small temporary increase in local employment of DOT&PF construction managers. No other impacts to the government sector of the economy are expected.

Transportation

Project construction would have no adverse effects on the major elements of the transportation sector of the local economy. Activities of the inter-island ferry and Alaska Ship and Drydock would be unaffected. Air traffic at Ketchikan International Airport would be unaffected by project construction. Floatplane operators could be required to change their routes and/or schedules during project construction; however, there would be no appreciable decrease in their overall activities or increases in costs attributable to construction of the project. Cruise ship activity could be affected by bridge alternatives that restrict their movement; however, these impacts are considered long-term project impacts and are not included in this evaluation of construction impacts.

Subsistence

Subsistence use of Pennock Island and southeastern Gravina Island could be adversely affected by construction of Alternative F3. Construction of Alternative F3 would disturb or destroy subsistence areas on Pennock and Gravina islands within and immediately adjacent to the construction right-of-way. It is anticipated, however, that most wildlife would move to adjacent areas offering the same habitat and the subsistence opportunities would not be reduced. Opportunity for subsistence use of plants and berries would not be substantially affected by F3.

4.0 Physical Environment

4.1 Geology, Topography, and Soils

Construction of any of the project alternatives would not affect the geology of the project area. Topographic features would be altered to construct the roadbed under any alternative; however,

these changes would occur within the construction right-of-way and would not affect any features of local significance. All alternatives would require cut and fill along the project corridor to construct the roadway and related bridge or ferry facilities. Native soils would be removed and replaced with fill aggregate. The soils removed from the area could be used for fill or incorporated into the landscape and revegetated to prevent erosion. A sedimentation and erosion control plan would be implemented during construction of any of the alternatives.

4.2 Water Resources

4.2.1 Hydrology

Project construction would involve the placement of piers and fill in Tongass Narrows adjacent to the airport and the placement of culverts and bridge structures at smaller stream crossings. In-water construction activities are likely to disrupt natural stream flow temporarily. Such effects would be localized and would not affect overall stream hydrology. In-water structures would be sized to maintain natural stream flow and drainage patterns over the long term. The long-term effects of piers and other in-water structures would be permanent impacts of the project and are not addressed in this evaluation of construction impacts.

The amount of fill along the airport shoreline would be greatest for the bridge alternatives that make landfall there: C3(a)/(b), C4, and D1. Placement of large quantities of fill would change the shoreline and alter flow in this part of Tongass Narrows. These effects would be long-term impacts of the project, persisting after construction is completed; therefore, these effects are not included in this evaluation.

4.2.2 Water Quality

Water quality could be affected by in-water and nearshore construction activities that remove vegetation and expose soils; disturb subaqueous sediments; and release fuels, chemicals, construction debris, and other pollutants to the ground surface and nearby water bodies. Runoff from construction sites could transport sediment and pollutants to Tongass Narrows and its tributaries. Runoff from the construction area would be controlled by best management practices to minimize erosion and transport of sediment and to prevent any accidental leaks of oil or fuel from equipment from contaminating creeks or Tongass Narrows. A sedimentation and erosion control plan and a spill prevention plan would be implemented during construction of any of the alternatives.

4.3 Air Quality

Construction of any of the project alternatives would not affect regional air quality. The amount of airborne particulate matter could be temporarily increased in the immediate vicinity of the construction site as a result of construction activities such as grading, placement of fill, hauling of materials, and cutting through rock that creates fugitive dust. Because of the frequency of rain in the Ketchikan area, often conditions are such that no dust is raised by construction activities. However, if and when needed, measures would be implemented to control fugitive dust at construction sites.

Emissions from the operation of construction equipment and vehicles would add to the amount of carbon monoxide and nitrogen oxides in the air, but the resulting increase in air pollutants would be negligible.

4.4 Noise and Vibration

Construction of a bridge or new ferry facilities for this project would generate noise from equipment such as motors, chain saws, front-end loaders, cranes, pile drives, power generators, and diesel-fueled trucks. The effects of construction noise would be most noticeable in the area immediately surrounding the construction site. Alternatives C3(a)/(b), C4, D1, and F3 would require construction in the vicinity of residential neighborhoods. Construction noise in these areas could disrupt residential activities. In accordance with City of Ketchikan noise regulations, construction activities would be prohibited between the hours of 11 p.m. and 6 a.m. to avoid disruption of residents.

If blasting with explosives is required during construction, vibration as well as noise would be generated. Such blasting would be controlled to avoid damage of nearby structures and to meet the requirements of the local noise ordinance. In-water blasting and pile driving would be controlled to ensure that the pressure waves generated do not pose a consistent, adverse threat to fish and other marine resources.

5.0 Biological Resources

Biological resources potentially affected by project construction include wetlands, aquatic (marine) habitat, and wildlife habitat. Impacts to these resources would result primarily from roadway construction and the placement of structures (bridge pier footings and ferry terminals) in Tongass Narrows. It is assumed that final design will seek to avoid or minimize construction impacts on these resources.

5.1 Vegetation

5.1.1 Uplands

Uplands in the project area (defined as land above mean high water [MHW]) are forested and provide habitat for many wildlife species, such as black bears, deer, wolves, smaller animals, and more than many species of birds (including bald eagles). Project construction activities associated with Alternatives C3(a)/(b), C4, and D1 would require the removal of upland vegetation on Revillagigedo Island near areas that are already developed. Roadway construction on Pennock Island (Alternative F3) and Gravina Island (all alternatives) would require the removal of upland vegetation in undeveloped areas. Most areas cleared of upland vegetation will be used for roadway development, resulting in permanent removal of this habitat. Roadside areas used for staging and construction activities would be revegetated.

5.1.2 Wetlands

Project impacts on wetlands are primarily permanent impacts resulting from the development of a roadway or ferry facility in wetland areas. Construction related impacts on wetlands would occur at staging areas and areas where temporary fill is required to facilitate the movement of construction equipment. The locations and extent of construction staging areas and temporary fill have not been determined. Use of wetlands for such construction activities would be minimized to the extent practicable. Wetlands could be returned to their pre-construction conditions once construction equipment and temporary fill are removed, provided the wetlands are regraded to preconstruction conditions and the area is revegetated.

5.1.3 Aquatic Habitats

Project construction would disturb or destroy areas of aquatic habitat in Tongass Narrows that support a wide variety of plant and animal life. Construction would cause increased erosion and turbidity, which could temporarily degrade aquatic plant habitat. In most areas, the currents through Tongass Narrows would quickly dissipate sediment, and the effects on marine plants would be temporary and minor. Eelgrass beds, which occur in subtidal areas, would not likely be affected by erosion and turbidity because the currents in these deeper water areas would flush out the finer grained sediments. In areas where excessive sedimentation could occur (e.g., cove areas, low velocity streams), vegetation could be permanently buried by sediment. Construction activities could also result in spills and accidental releases of petroleum products from work vessels or tank trucks near the water. Spilled oil or diesel fuel in the small salt marshes at the mouths of Lewis Creek (Alternative G2) or Government Creek (all alternatives), or in the marsh fringes along substantial portions of the Gravina Island shoreline would have significant and lasting impacts on salt marsh plants and animals contacted. Petroleum products spilled in intertidal areas could affect plant physiology, growth, reproduction, and development. Recovery of most plant species from a large-quantity oil spill would be expected within 1 to 2 years.

A sedimentation and erosion control plan and a spill prevention plan would be implemented during construction of any of the alternatives.

5.2 Wildlife

5.2.1 Aquatic Species

The *Marine Environment Preliminary Impact Assessment Technical Memorandum* (April 2000) determined that marine animals could be affected by construction as a result of increased erosion and turbidity, noise, direct displacement, and spills of petroleum products. Erosion and turbidity would be caused by the movement of sediment and rock to fill shoreline areas for the construction of Alternatives C3(a), C3(b), C4, and D1, or to build out ferry terminals for Alternatives G2, G3, and G4. Installation of in-water piers for Alternatives C3(a), C3(b), C4, D1, and F3 could also cause increased turbidity. Excessive sedimentation rates could affect existing sedentary biota in intertidal and subtidal areas; however, strong currents in subtidal areas would quickly dissipate waterborne sediment and reduce the amount of sedimentation in those areas.

The movement of significant amounts of soil and rock for purposes of building the roads associated with the bridges and ferry terminals would likely generate sediment-laden runoff, which could raise the water turbidity in nearby streams to high levels. This could have a detrimental effect on water quality in anadromous streams; however, the direct effects on juvenile or adult salmon would be minor [See *Marine Environment Preliminary Impact Assessment Technical Memorandum* (April 2000)]. Runoff from the construction area would be controlled by best management practices to minimize erosion and transport of sediment. A sedimentation and erosion control plan would be implemented during construction of any of the alternatives.

Bridge and ferry terminal construction would transmit in-water noise generated by dredging, fill placement, pile driving, and movement of construction barges. Construction noise generated above the water by assembly of bridge and ferry facilities could also be transmitted into the water through steel or concrete structures. In addition, preparing foundations for bridge piers would generate more noise from pile driving and removal, predrilling, and perhaps in-water blasting. All of these noise sources would temporarily elevate noise levels above the existing background noise levels. The effects of construction noise on marine and anadromous fish are expected to be minimal and localized [See *Marine Environment Preliminary Impact Assessment Technical Memorandum* (April 2000)].

The placement of concrete, rock, and other fill materials in intertidal areas would displace fish species and permanently eliminate their spawning and foraging habitat. Construction activities in eelgrass beds would eliminate important feeding and refuge areas for several species of fish and shellfish, causing displacement of these species. Because of the abundance of similar habitat in Tongass Narrows, it is unlikely that the temporary impacts of construction on fish habitat would have significant effect on these species; however, permanent removal of spawning and foraging habitat could have long-term effects on some fish species. These long-term effects of the project are detailed in the *Marine Environment Preliminary Impact Assessment Technical Memorandum* (April 2000).

The aquatic environment is vulnerable to contamination from oil and fuel spills from construction equipment and barges operating in and near the waters of Tongass Narrows. Heavy initial mortalities of invertebrates would be expected on intertidal shorelines oiled with fresh diesel oil, and sublethal effects might be observed in their physiology, growth, reproduction and development, and behavior. Birds associated with the water (ducks, shorebirds) would potentially become oiled and suffer from hypothermia or might bring oil back to their nests, injuring or killing eggs or young. Ingestion of oil by birds also can be fatal. Marine mammals could experience the same impacts. [See *Marine Environment Preliminary Impact Assessment Technical Memorandum* (April 2000).] Best management practices will be used to prevent any accidental leaks of oil or fuel from equipment from contaminating creeks or Tongass Narrows. A spill prevention plan would be implemented during construction of any of the alternatives.

Amphibians

Construction activity related to roadway development on Gravina Island would disrupt the movements and eliminate habitat of amphibians, which inhabit wetland, creeks, and terrestrial areas. Because these animals have limited mobility, clearing the construction areas would likely result in the permanent loss of amphibians living in those areas. The alignments of the project alternatives were selected to avoid impacts to wetlands and streams to the extent practicable, thereby reducing the potential effects on amphibious populations.

Birds

Bird habitat in and immediately adjacent to roadway and bridge alignments or ferry terminal areas would be disturbed or permanently removed as a result of construction activities. Construction activities could temporarily displace birds from nesting, resting, and foraging habitat in construction zones. In general, birds would relocate to adjacent habitat and overall impacts to birds would be minor.

Land Mammals

Construction activity related to roadway development on Gravina Island could disrupt the movements and eliminate habitat of land mammals. Noise and disturbance generated by construction equipment would likely drive large land mammals from the area without physically harming the animals. Smaller, less mobile mammals might not be able to move quickly from construction zones and could be killed during construction. Most mammals are likely to move away from the construction zones to other areas on Gravina Island that provide similar habitat. Construction impacts on these species would be minor.

Protected Species

The endangered humpback whale and threatened Steller sea lion could be affected by construction activities associated with the project. Humpback whales could be affected directly by underwater noise associated with construction of a bridge or ferry terminals. These effects could be avoided by the use of seasonal work windows and observers to monitor for the presence of whales and suspend action until whales have cleared the area. Stellar sea lions would not likely be affected by underwater noise associated with construction activities because they have high thresholds for noise disturbance and are able to lift their heads out of the water to avoid noise transmission. Construction activities that require underwater explosives could adversely affect Steller sea lions. An observer could be used to avoid blasting when Steller sea lions are in the area. [See *Biology Report* (October 2001).]

6.0 Historic and Archeological Resources

Construction activities could have direct impacts on historic and archeological features within the construction right-of-way. There are no known resources occurring within the proposed alignments of Alternatives C3(a)/(b), C4, D1, or G4 and the likelihood of encountering resources during construction of any of these alternatives is low. Alternatives F3, G2, and G3 would

traverse areas where historic and archeological sites are known to occur and/or are likely to occur. A detailed evaluation of the effects of the project on historic and archeological resources in accordance with 36 CFR 800.4 will be conducted once a preferred alternative is selected. Mitigation of adverse impacts to historic and archaeological resources would be determined through consultation with the Alaska State Historic Preservation Officer and appropriate land management agencies and tribal communities.

7.0 Visual Environment

Construction of Alternatives C3(a), C3(b), C4, D1, and F3 bridges would introduce to Tongass Narrows a noticeable new structure to the current views of natural features and man-made structures, and the presence of large cranes, barges, and other operating equipment in the channel would be apparent. The taller cranes used for construction of the 185/200-foot bridges associated with Alternatives C3(a), C4 and F3 would be more visible than the cranes used for construction of the 60-foot F3 bridge and the 120-foot C3(b) and D1 bridges. Because of the industrial character of the waterfront and the presence of man-made features in the area's viewsheds, the impact to the visual environment would be minor. Construction of the 185/200-foot bridge for Alternative F3 would not be visible from Ketchikan.

Construction of roadways and bridge approaches on Revillagigedo Island would adversely affect the visual character of the area immediately surrounding the construction zones. This temporary effect would have a minor impact on visual resources. Construction of roadways and bridge approaches on Gravina Island would not be visible from most areas of Ketchikan.

Construction of the new ferry terminal for Alternative G2 or G3 on Gravina Island, amid the existing natural features, would have an impact on views of the shoreline. The Alternative G2 ferry terminal on Gravina Island would not be seen from most of Ketchikan, therefore, the impacts would be minor. The Alternative G3 ferry terminal on Gravina Island would be visible from downtown Ketchikan and construction of the facility could have a moderate visual effect because of the change from an uninterrupted natural shoreline view to a view of a segmented shoreline with a cleared area and construction equipment. The construction of Alternative G4 ferry terminal on Gravina Island would occur in an area that is dominated by airport structures and riprap; therefore the visual impacts of construction would be minor. Construction of a ferry terminal for Alternatives G2 or G4 on Revillagigedo Island would have minor visual impacts due to the industrial character of the terminal sites. Construction and demolition associated with Alternative G3 would adversely affect the visual character of this downtown site.

8.0 Transportation

8.1.1 Aviation

The operations of fixed-wing aircraft (with the exception of floatplanes) in the project area would not be affected by construction of any of the project alternatives. The operations of floatplanes would not be affected by construction of the ferry alternatives (G2, G3, and G4), but could be affected by construction of the bridge alternatives (C3[a]/[b], C4, D1, and F3). During construction of the bridge under Alternative C3(a)/(b), C4, or D1, the operation of large cranes

and other heavy equipment in the channel would interfere with floatplane operations because of the physical obstructions in Tongass Narrows and the available airspace. Approaches to and use of the airport's floatplane dock would be affected by construction of these bridge crossings at the airport. Long-term impacts to aviation operations are addressed in detail in the *Ketchikan Airspace Impacts Assessment* and *Ketchikan Airport Land and Operations Impacts Technical Memoranda* (December 2001). These effects would continue beyond the construction phase of the project and therefore were not analyzed specifically as a construction impact. Construction of Alternative F3 bridges would similarly affect floatplane operations, however, the locations and heights of these structures relative to most floatplane operation indicate that the temporary impact of construction would be minor.

Temsco Helicopters Inc. and Alpine Helicopters Inc. operate from Peninsula Point, the site of the G2 ferry terminal. Construction of the ferry terminal on Peninsula Point could temporarily disrupt helicopter operations at these facilities.

8.1.2 Marine Navigation

Construction of Alternatives G2, G3, and G4 would have no effect on marine navigation. The Tongass Narrows main channel would remain open to marine traffic throughout construction of Alternatives C3(a), C4, and F3; however, Alternatives C3(b) and D1 would, at some point during construction, prevent passage of ships requiring greater than 120 feet of vertical clearance. Construction of a 120-foot bridge would require large cruise ships calling in Ketchikan to enter and leave the port from the south. For voyages to and from points north of Ketchikan, these ships would need to be routed along the western side of Gravina Island instead of through Tongass Narrows, which would add approximately 35 miles to their travel distance. For Alternative F3, construction of the 60-foot bridge in the East Channel would require that ships needing greater vertical clearance use the West Channel only; and ship traffic there could be restricted to one-way traffic by the USCG because of the 550-foot horizontal clearance of the West Channel bridge. The effects of closing Tongass Narrows and the East and West channels to any ships are considered long-term effects of the project and are not addressed in this evaluation of construction impacts.

All bridge alternatives would likely require cruise ships to decrease their speed near construction areas and adjust their routes and possibly schedules to avoid the mooring buoys and construction zones around and under bridge piers and spans. If construction requires lifting bridge panels from barges on the water into position on the bridge, cruise ship passage under the bridge would be prohibited during each lift, an operation that usually takes one to two hours. This impact could possibly be minimized by scheduling lifts during the mid-day (or even late evening) hours when there is little cruise ship traffic. Or, to avoid major impacts on the cruise ships, it may be necessary to suspend construction during the cruise ship season (May through September). For Alternative F3, impacts on navigation could be minimized by constructing each bridge in a separate phase so that one of the two channels would always be unaffected by construction activities.

The existing ferry service between Revillagigedo Island and the airport would be unaffected by construction of the ferry alternatives and Alternative F3. However, construction of Alternatives

C3(a)/(b), C4, and D1 could require moving the Airport ferry terminal facility to accommodate construction of the bridge structure in that area. Moving the facility would be staged so that impacts to ferry operations would be minimized.

Marine vessels other than cruise ships and ferries, such as commercial fishing boats, charter fishing boats, and other small craft, would not be affected by construction of any project alternative, except for minor route adjustments to avoid construction zones.

8.1.3 Roadways

On Revillagigedo Island, construction of the project bridge alternatives would not require any traffic detours. Construction could cause some traffic delays on Tongass Avenue where it is crossed by Alternatives C3(a)/(b), C4, and D1, and on Tongass Highway near the U.S. Coast Guard Base and Alternative F3. Alternative F3 would require reprofiling Tongass Highway. Alternatives C3(a) and C3(b) would require changing the configuration of the Signal Road-Tongass Avenue intersection. Alternatives C4 and D1 could affect access to the Cambria neighborhood. Construction activities would temporarily disrupt traffic patterns and could cause delays. The construction contractor would be responsible for developing a traffic maintenance plan to minimize impacts to Ketchikan roadways.

Construction of all alternatives in the vicinity of the airport would affect traffic circulation and airport parking. Alternatives C3(a)/(b), C4, and D1 would require temporary relocation of the ferry terminal and approach ramp, which would change the traffic flow configuration. Some parking spaces may be eliminated to accommodate construction vehicles and the new ramp location. The construction contractor would be responsible for developing a traffic maintenance plan to minimize impacts to airport traffic.

8.1.4 Pedestrians and Bicyclists

Project construction would have no effects on pedestrians and bicyclists, most of whom are in the downtown Ketchikan area.

9.0 Hazardous Waste Sites

There are no known hazardous waste sites that would be affected by construction of any of the project alternatives.

Depending upon the alternative selected for construction, certain sites have the potential to contain hazardous waste. Further study would be required to determine whether any hazardous waste exists, and whether it would be affected by project construction, for the following alternatives:

- All Alternatives: Ketchikan International Airport
- Alternatives C3(a) and C3(b) (roadway): Bank property and car dealership at Tongass Avenue and Signal Road

- Alternatives C4 and D1 (roadway): Quarry site on Revillagigedo Island and its construction staging area
- Alternative G2: Pro Mech Hangar on Peninsula Point
- Alternatives G3 and G4: Commercial and industrial areas at Ferry Terminal sites on Revillagigedo Island

10.0 Utilities

Project construction could require relocation of some water, sewer, and/or electrical utility lines. Proper planning and coordination with the utilities would prevent any disruption of service. No major utility facility would be affected, as none lies within the project alignments for any of the alternatives.

11.0 Energy

Many of the construction activities associated with the project will require the use of machinery, equipment, and vehicles powered by petroleum fuels. Each alternative would likely require the consumption of a different amount of energy, depending on the duration of construction and the types of construction equipment required. These factors have not been determined and, therefore, energy consumption related to each alternative is not known.